REMARKS

Applicants thank the Examiner for the careful and consistent review of the specification and claims.

The Examiner has made a variety of basically formal objections to the specification and claims. Applicants assert that the amendments represented in this paper have remedied all objections.

Before discussing each rejection, Applicants assert that throughout the Examiner's rejections, the Examiner has been citing polymer related prior art dealing with lare fiber, macrofiber materials and macrofiber structures (greater than 2 microns typically greater than 5 microns). Such prior art is simply irrelevant to fine fiber or nanofiber technology (e.g. less than 0.5 micron). Fine fiber or nanofibers have a diameter so substantially smaller than typical fibers used as macrofiber that there is no predictive capacity that the properties disclosed for large fibers will be present in nanofiber technology. Accordingly, unless the Examiner has applied teachings from prior art relating to or predicting nanofiber, the rejections should not be maintained. Further, since the Examiner relies on a combination of four and five different references for many of the rejections, Applicants argue that these rejection is constructed entirely by hindsight, by looking at the invention as a model and then searching for each specific component in a different patent of a large grouping of patents.

Applicants have amended the independent claims to recite certain substrate and fine fiber dimensions and parameters. Support for this amendment is found on pages 31 and 32 of the specification as filed. Claims 13 and 14 have been amended to recite that the additive forms a protective coating on the fiber. Support is found at page 14, line 31.

Applicants will address the rejection of the independent claims; mainly, the Examiner's rejections in paragraphs 10 and 28, in which the Examiner rejects, among other claims, claims 1 and 50.

The Examiner has rejected claims 1-6, 8 and 45-49 under 35 U.S.C. § 103(a) over Raether, U.S. Patent No. 5,562,746, in view of Kahlbaugh et al., U.S. Patent No. 5,672,399. In summary, the Examiner appears to assert that incorporating the Kahlbaugh et al. filter structure into the air filter assembly of Raether to provide an improved structure with longer useful life at a given efficiency and flow rate is obvious. Applicants respectfully traverse the rejection

because, first, Kahlbaugh et al. and Raether cannot be logically combined and second, even if combined, do not obtain the invention claimed.

The Examiner admits that Raether has no pleated structural aspect. As such, Raether seems to be inappropriate for the rejection. Kahlbaugh et al. is a teaching that involves pleating media in certain embodiments of the invention; however, the use of the media in Kahlbaugh et al. is unique and quite different than the claimed pleated media and fine fiber layers. Kahlbaugh et al. clearly disclose a very different structure. In Kahlbaugh et al., the primary concept is to add an additional layer of fine fiber to a non-filter type support. The supports in Kahlbaugh et al. are not filter substrates and do not attain filtration properties until sufficient layers of fine fiber are created to effect sufficient filtration for a design engineer purposes. In other words, Kahlbaugh et al. disclose multiple layers of fine fiber separated by a separation layer having no significant filtration properties. With this in mind, it would be unobvious to incorporate a filtration support material such as that disclosed in Raether into the pleated structure shown in Kahlbaugh et al. Such a substitution would be entirely opposite to the purpose of Kahlbaugh et al. using a non-filtration support material. Further, it would not be obvious to pleat the filtration media in Raether, since Kahlbaugh et al. pleats a non-filtration support material that simply passes material through the support layer. Please note Applicants have amended the independent claims of the application to show that the support of the claims has a dimensions and properties appropriate to a filtration support.

Further, Raether is basically directed to a system configuration having a particular housing. The housing permits back pulse cleaning methods to remove dust cake from filter substrates. Raether teaches nothing about any specific kind of media. In the absence of some specific discussion of useful media in Raether, it is illogical to combine Raether with Kahlbaugh et al. Even when combined, neither Raether nor Kahlbaugh et al. teach any substantial information about a filtration substrate material. In summary, in the absence of any specific teaching regarding substrate materials, neither Raether nor Kahlbaugh et al. teach filtration substrates having a fine fiber layer as claimed. Using a filter comprising one layer of filtration media and one or more layer of fine fiber with no non-filtration separation layer is simply not obvious. Applicants assert that claims dependent on claim 1 are allowable in light of the allowable nature of claim 1.

In paragraph 28 of the action, The Examiner has rejected claims 50-55 under 35 U.S.C. § 103(a) over Raether, U.S. Patent No. 5,562,746 in view of Kahlbaugh et al., U.S. Patent No. 5,672,399 in a rejection substantially similar to that of paragraph 10. The Examiner's comments imply that the claim structure is obviously used at the parameters of the method claim. Applicants respectfully traverse the rejection.

Applicants assert that it would not be obvious to filter a stream using the filter having the components of the amended claims. The Examiner admits in the Action, in both paragraphs 10 and 28, that the details of the substrate and fine fiber of the structure and the filtration parameters are not specifically disclosed in the prior art. Since Applicants have recited a structure in a filtration process not disclosed in the prior art, Applicants assert that these claims are allowable. Further, the amended claims recite preferred dimensions and other parameters for both the substrate and the fine fiber layer not disclosed by the prior art. Applicants assert that the claims are also allowable for that reason, as well. Moreover, Kahlbaugh et al. and Raether cannot logically be combined and, even if combined, do not obtain the invention claimed. Using a filter comprising one layer of filtration media and one or more layer of fine fiber with no non-filtration separation layer is simply not obvious.

The Examiner admits that Raether has no pleated substrate. As such, Raether seems to be inappropriate to base an obviousness rejection. Kahlbaugh et al. teach involving a pleated layer that does not contain filtration media. Since Kahlbaugh et al. do not disclose a filtration media, Kahlbaugh et al. clearly disclose a very different structure. In Kahlbaugh et al., the primary concept is to add additional layers of fine fiber to the non-filter type support layers until the fine fiber layers provide sufficient filtration capacity. The separation layers or supports in Kahlbaugh et al. are not filter substrates and do not attain any filtration properties until sufficient layers of fine fiber are created to effect sufficient filtration for the design engineer's purposes. In other words, Kahlbaugh et al. disclose multiple layers of fine fiber separated by a separation layer having no significant filtration properties. With this in mind, it would be unobvious to incorporate a filtration support material such as that disclosed in Raether into the pleated structure shown in Kahlbaugh et al., since Kahlbaugh et al. clearly suggest that filtration supports are unnecessary. Such a substitution would be entirely opposite to the purpose of Kahlbaugh et al. using a non-filtration support material. Further, it would not be obvious to pleat the filtration media in Raether, since Kahlbaugh et al. pleat non-filtration support materials. Using a filter

comprising one layer of filtration media and one or more layer of fine fiber with no non-filtration separation layer is simply not obvious.

Please again note Applicants have amended independent claims 1 and 50 of the application to recire that the fine fiber and filter support layers of the invention have dimensions and parameters appropriate for filtration support purposes not taught by the prior art.

Raether is directed to a system configuration having a particular housing configuration. That housing is designed to enable reverse pulse cleaning methods to remove dry dust cake from filter substrates. Raether teaches nothing about any specific kind of media. In the absence of some specific discussion in useful media in Raether, it is illogical to combine Raether which is virtually devoid of any discussion of media with Kahlbaugh et al. which clearly suggests that filter media are not necessary. Even when combined, neither Raether nor Kahlbaugh et al. teach any substantial information about the important dimensions and parameters of either the fine fiber layer or the filtration support layer. Using a filter comprising one layer of filtration media and one or more layer of fine fiber with no non-filtration separation layer is simply not obvious. Applicants assert that claim 50 and all claims dependent on claim 50 are allowable in light of this rejection.

The Examiner has rejected claim 7 under 35 U.S.C. § 103(a) over Raether and Kahlbaugh et al. as applied above to claim 6 further in view of Barris et al., U.S. Patent No. 4,650,506. The Examiner appears to argue that the teachings of Barris et al. can be combined with Raether and Kahlbaugh et al. in that Barris et al. teaches a PVC fine fiber material. Applicants respectfully traverse.

Barris et al. teach a very different structure than is claimed in claim 1. Barris et al. require a cover layer 18 over a fine fiber layer 14 that is bonded to a substrate 12. The teachings of Barris et al. suggest that the fine fiber layer, for utility purposes, requires a cover layer to protect the fine fiber layer. Accordingly, it is simply not obvious to select the fine fiber layer from the broad teachings of Barris et al. and simply insert it into the structure of Kahlbaugh et al. without the cover layer. Accordingly, it is simply not obvious to use the materials in Barris et al. as the fine fiber layer in Kahlbaugh et al. Further, Barris et al. suggest that the fine fiber layer should be adhered to a filtration substrate material, since Kahlbaugh et al. suggest that no filtration substrate material is useful, Kahlbaugh et al. and Barris et al. are simply not combinable under 35 U.S.C. § 103.

The Examiner has rejected claims 10 and 11 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al., Emig et al. U.S. Patent No. 6,395,046, and Taniguchi, European Patent No. 351046. Applicants respectfully traverse.

While Emig et al. may generally talk about crosslinking a polyvinylalcohol with a crosslinking agent such as polyacrylic acid, the Emig et al. materials are used in a retail consumer vacuum bag structure. The Emig et al. materials are engineered to be used in a flexible vacuum cleaner bag, not in a rigid structure as shown in the claims. Further, the conditions of use of a vacuum cleaner bag are different than the conditions of use of the claimed structure. As such, no one of ordinary skill in the art would combine the Emig et al. fine fiber from a consumer vacuum bag into the filter structure of the invention. Similarly the Taniguchi materials are macro yarns, not fine fiber.

The Examiner has rejected claim 11 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. and Emig et al., further in view of Elmasry, U.S. Patent No. 6,348,432. The Examiner appears to argue that it would be obvious to substitute the materials shown in Elmasry for the fine fiber material of the invention. Applicants traverse the rejection.

The materials of Elmasry are used as coatings and recording materials in a utility totally different than a fine fiber layer. There is nothing in Elmasry that suggests that these materials would be operable in a fine fiber layer having a fine fiber dimension as suggested in the application. Such diameters are so small that the properties of coatings and recording materials would not be predictive of properties at a fine fiber diameter size. Accordingly, one of ordinary skill in the art would not apply the teachings of Elmasry to the filter structure or methods of the invention.

The Examiner has rejected claims 13, 14, 26-31 under 35 U.S.C. § 103 over Raether and Kahlbaugh et al., further in view of Gallucci , U.S. Patent No. 4,849,474. The Examiner argues that the Gallucci materials are the same as that claimed. Applicants respectfully traverse the rejection.

Applicants have amended the claims to recite that the additive material, while miscible in the polymer during manufacture, blooms to the surface of the fiber and forms a protective coating layer around the fine fiber. Such a structure is not taught in Gallucci and, as such, is not obvious in light of the teachings in Gallucci.

The Examiner has rejected claim 15 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. and Gallucci as applied above, further in view of Barris et al., U.S. Patent No. 4,650,506, further in view of Suhonen et al., U.S. Patent No. 5,842,489. Applicants respectfully traverse the rejection.

The Examiner admits that Barris et al. do not disclose an aqueous alcoholic solvent for fiber formation. Accordingly, Barris et al. is simply not relevant. Suhonen et al. teach using an aqueous alcoholic solvent for the purpose of forming a coating on a dental floss fiber. The dental floss fiber is passed through an aqueous alcoholic solvent containing solubilized polymer for the purpose of coating the dental floss with a coating that maintains the floss in an intact form during use. Applicants assert that this teaching is irrelevant to the invention, since Applicants are manufacturing a fine fiber having a very small diameter, while the Suhonen et al. reference does not teach a fine fiber, but teaches a coating formed on a macrofiber. One of ordinary skill in the art would not assume that such coatings technology could be used in fine fiber formation.

The Examiner has rejected claims 16 and 18 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al., Gallucci, Emig et al. as discussed above, further in view of Baumann et al., U.S. Patent No. 6,354,296. In large part, the Raether, Kahlbaugh et al., Gallucci, Emig et al. references are applied above. The Examiner argues it would be obvious to select polyester (polyethylene terephthalate) fibers for forming fine fibers based on the teaching in Baumann et al. at Column 5, lines 45-67. Applicants respectfully traverse.

Applicants assert that the fibers in Baumann et al. having "a mean fiber diameter less than about 10 microns" suggests to one of ordinary skill in the art relatively large macrofiber materials. Nothing in Baumann et al. that would suggest to one of ordinary skill in the art that these materials can be used in fine fiber structures having a diameter less than about 0.5 micron, a 20 fold reduction in diameter. Applicants respectfully request the Examiner to withdraw this rejection.

The Examiner has rejected claim 17 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al., Gallucci, Emig et al., Baumann et al., further in view of Asano et al., U.S. Patent No. 6,177,192. The Examiner asserts that the polyethylene naphthalate fibers of Asano et al. is an obvious substitution in the fine fiber layers of the invention. Applicants respectfully traverse.

The fibers in Asano et al. are used for forming a heavy drier canvas fabric used in papermaking. Those familiar with such canvas layers know that such layers have to be very

rugged and must be sufficiently strong to survive papermaking operations involving substantial mechanical stress, substantial quantities of water flux and broad variations in temperature and pressure. In such applications, only the highest strength, most robust fibers will survive the formation of such a canvas layer. One of ordinary skill in the art would not rely on the passage in Asano et al. at Column 1, lines 42-45 to suggest improving the durability of fine fiber or nanofiber based on the macrofiber and canvases made from macrofiber as shown in Asano et al. The technology in Asano et al. is simply completely different than that set forth in the claimed invention.

The Examiner has rejected claim 19 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. and Gallucci, further in view of Baumann et al. The Examiner suggests that the fibers of Baumann et al. in Column 5, lines 45 et seq. disclose forming nylons from cyclic lactams. Applicants respectively traverse.

Again, Baumann et al. is irrelevant to the invention, since the Baumann et al. fibers are relatively large macrofibers substantially greater than 0.5 micron and typically in the order of 1 to 10 microns as disclosed in the Baumann et al. specification. Accordingly, Applicants respectfully request the Examiner to withdraw this rejection.

The Examiner has rejected claims 20-23 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. and Gallucci as applied above, further in view of Okamoto et al., U.S. Patent No. 3,731,352. The Examiner suggests the fibers of Okamoto et al. are obvious for use in the fine fiber layers of the invention. Applicants respectfully traverse.

The Okamoto et al. materials are used in forming non-woven structures from a random deposit of fine fiber into a continuous layer. One of ordinary skill in the art reading Okamoto et al. will assume that the fibers in Okamoto et al. are of substantial thickness and would have substantial mechanical strength in the non-woven fabric. The examples of the invention showing a fiber sheet having a thickness of 4.36 millimeters and substantial thickness of from about 2 to 3 denier (Example 1). Such a teaching would not be used by one of ordinary skill in the art making a fine fiber or a nanofiber filter structure. Such structures, as claimed, are so different than the non-woven fabrics of the reference that the technology is simply not combinable.

The Examiner has rejected claims 24 and 25 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al., Gallucci and Okamoto et al., further in view of Ueda et al., U.S. Patent No. 3,739,055. Applicants respectfully traverse.

Applicants have demonstrated that the Okamoto et al. reference is not relevant to the fine fiber or nanofiber layers of the invention. Ueda et al. is similar to Okamoto et al. in that it treats fibers used in high strength fabrics not in fine fiber or nanofiber layers. The Okamoto et al. and Ueda et al. technologies are so different than fine fiber or nanofiber layers, one of ordinary skill in the art would not apply the technology to the claimed structures.

The Examiner has rejected claims 32-34 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. and Gallucci as applied above, further in view of Jariwala et al., U.S. Patent No. 6,391,807. The Examiner argues that the fluorochemical oligomer shown in the reference is obvious for use in fine fiber or nanofiber structures. The Jariwalamaterials are resins used in (e.g.) packaging, release liners and laminate structural objects not nanofiner. Such teachings are not relevant to nanofiber claims.

The Examiner has rejected claims 35-38 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. Gallucci as applied above, further in view of Emig et al. The Examiner argues that the urethane, blended urethane and polyamides disclosed in Emig et al. can be substituted for the fine fibers of Kahlbaugh et al. in the rejection. Applicants respectfully traverse.

Emig et al. brings nothing relevant to the fine fibers of the invention. The invention involves a fine fiber layer on a substrate in a particular structure. The Emig et al. structure is a flexible vacuum cleaner bag having a substantially different purpose structure and overall flow parameters. One of ordinary skill in the art would not select technology from vacuum cleaner bags for such industrial filtration applications.

The Examiner has rejected claim 40 under U.S.C. § 103 over Raether and Kahlbaugh et al, further in view of Idemura et al., U.S. Patent No. 6,063,862. The Examiner argues that the fibers formed in Idemura et al. are the obvious substitutes for the fine fiber or nanofiber structures of the invention. Applicants respectfully traverse.

Idemura et al. disclose a very unique composite comprising a mixed water glass (a sodium silicate) and a polyamide. This technology is irrelevant to the fine fiber or nanofiber technology claimed. First, Idemura et al. do not teach or suggest any aspect of fine fiber technology and, as such, cannot be combined with the primary references of the invention. Further, the compositions including a silica glass and polyamide reactants are so different than the fine fiber structures of the invention that one would not substitute the Idemura et al. compositions for the nylon materials used in forming the fine fiber structures. Idemura et al.

teach that its materials are useful in papers and sheets made from a conventional fiber. Since Idemura et al. is primarily directed to forming papers or sheets from this material, one of ordinary skill in the art would not use it in forming nanofibers. Fibers useful in forming such papers or sheets are generally macrofiber structures, totally different than the fine fiber or nanofiber structures of the invention.

The Examiner has rejected claim 41 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. and Gallucci as applied above, further in view of Muto et al, U.S. Patent No. 5,324,558. Applicants respectfully traverse the rejection.

Muto et al. are directed to the formation of a laminated tube from a composite structure. The composite comprises a reinforcing fiber and a matrix resin. The composite materials in Muto et al. have nothing to do with fine fiber formation. The cited portion of Muto et al. relates to a three layer laminate tube made by a tape wrapping process involving curable resins, carbon fiber, glass fiber and polyester fiber in combination for a tubular high strength composite. Nothing in this reference suggests that aromatic polyamide or polyester material can be useful in the fine fiber structures of the invention.

The Examiner has rejected claim 42 under 35 U.S.C. § 103 over Raether, Kahlbaugh et al. and Gallucci as applied above, further in view of Dzenis et al., U.S. Patent No. 6,265,333. The Examiner argues that substituting the polybenzimidazole of Dzenis et al. for the condensation polymers of Raether, Kahlbaugh et al. and Gallucci is obvious. Applicants respectfully traverse.

As shown in Figure 1 of Dzenis et al., the disclosed invention in the reference involves a three ply composite high strength fabric material. The fabric uses woven plies that can be made from small diameter reinforcement fibers. The non-woven fabrics of Dzenis et al., such as that shown in Column 12, lines 36-38, are applications in high strength multiply composite fabrics so different than the fine fiber layers of the invention, one of ordinary skill in the art would not utilize the materials of Dzenis et al. in the fine fiber layers.

The Examiner has rejected claim 43 under 35 U.S.C. § 103(a) over Raether, Kahlbaugh et al. and Gallucci as applied above arguing that the polyarylate materials of Ueda et al. are an obvious substitute for the fine fiber materials of the claimed invention. Applicants respectfully traverse.

Ueda et al., as discussed above, relates to macrofiber materials used in high strength applications. In the fine fiber art, it is not obvious to use macrofiber teachings to modify fine fiber materials. One of ordinary skill in the art would not look to Ueda et al. for any teaching to improve the properties of fine fiber materials. Ueda et al. materials are high tension, high strength, substantially heat resistant materials used in reinforcing elastic materials, particularly for use in tire reinforcing cord. Such an application is so different than fine fibers, no one of ordinary skill in the art would look to this reference for any relevant teaching in the fine fiber arts.

The Examiner has rejected claim 44 under 35 U.S.C. § 103(a) over Raether, Kahlbaugh et al., Gallucci, Ueda et al. and Okamoto et al.,. The Examiner argues that the bis-phenol A phthalic acid polyarylate polymer from Okamoto et al. is an obvious modification of the fine fiber materials of the invention. Applicants respectfully traverse this rejection. Again, the Okamoto et al. technology, as discussed above, teaches nothing about fine fibers, is related primarily to macrofibers and provides no teaching that one of ordinary skill in the art would use for modifying fine fiber materials.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE"

Respectfully submitted,

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Date

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification

Please replace pages 53-55 with attached new pages 53-55 in portrait format.

In the Claims

Please cancel claims 33, 34 and 56.

Please amend the claims as follows:

1. (AMENDED) An air filter assembly comprising:

(a) a housing including an air inlet, an air outlet, a spacer wall separating said housing into a filtering chamber and a clean air chamber; said spacer wall including a first air flow aperture therein;

(b) a first filter construction positioned in air flow communication with said first air flow aperture in said spacer wall; said first filter construction including an extension of a pleated filter media composite defining a filter construction inner clean air chamber;

(i) said first filter construction being oriented with said filter inner clean air chamber in air flow communication with said spacer wall first air flow aperture;

(ii) said pleated filter media composite including a substrate, the substrate having a permeability of about 2 to 900 meters-min^{-1}, a basis weight not greater than 200 grams-m^{-2} and a thickness of 25 to 800 microns, the substrate at least partially covered by a layer of fine fiber having a thickness of about 1 - 8 times the fine fiber diameter;

(A) said fiber comprising a diameter of about 0.01 to 0.5 microns that after exposure for a test period of 16 hours to test conditions of 140°F air and a relative humidity of 100% retains greater than 30% of the fiber unchanged for filtration purposes

(c) [(d)] a pulse-jet cleaning system oriented to direct a pulse of air into said filter construction inner clean air chamber.

3. (AMENDED) An air filter assembly according to claim 2 wherein the polymer comprises a condensation polymer.

4. (AMENDED) An air filter assembly according to claim 2 wherein the polymer comprises an addition polymer.

7. (AMENDED) The air filter assembly [composition] of claim 6 wherein the polyvinylidene halide comprises polyvinylidene chloride.

8. ((AMENDED) The air filter assembly [composition] of claim 6 wherein the polyvinylidene halide comprises polyvinylidene fluoride.

9. (AMENDED) The air filter assembly [composition] of claim 4 wherein the polymer comprises a polyvinylalcohol.

10. (AMENDED) The air filter assembly [composition] of claim 9 wherein the polyvinylalcohol is crosslinked with about 1 to 40 wt.% of a crosslinking agent.

11. (AMENDED) The air filter assembly [composition] of claim 10 wherein the crosslinked polyvinylalcohol is crosslinked using a polyacrylic acid having a molecular weight of about 1000 to 3000.

12. (AMENDED) The air filter assembly [composition] of claim 10 wherein the crosslinked polyvinylalcohol is crosslinked using a melamine-formaldehyde resin having a molecular weight of about 1000 to 3000.

13. (AMENDED) The air filter assembly [polymer] of claim 3 comprising a condensation polymer, other than a copolymer formed from a cyclic lactam and a C_{6-10} diamine

monomer or a C_{6-10} diacid monomer, and a resinous additive comprising an oligomer having a molecular weight of about 500 to 3000 and an aromatic character wherein the additive is miscible in the condensation polymer, the additive forming a protective coating on the fine fiber.

14. (AMENDED) The air filter assembly [polymer] of claim 3 comprising a condensation polymer, other than a copolymer formed from a cyclic lactam and a C_{6-10} diamine monomer or a C_{6-10} diacid monomer, and a resinous additive comprising an oligomer having a molecular weight of about 500 to 3000 and an alkyl phenolic aromatic character wherein the additive is miscible in the condensation polymer, the additive forming a protective coating on the fine fiber.

15. (AMENDED) The air filter assembly [polymeric composition] of claim 14 wherein the polymer is a component of a solution, the solution comprising a major proportion of an aqueous alcoholic solvent and about 3 to 30 wt% of the polymeric composition.

16. (AMENDED) The air filter assembly [composition] of claim 14 wherein the condensation polymer comprises a polyalkylene terephthalate.

17. (AMENDED) The air filter assembly [composition] of claim 16 wherein the condensation polymer comprises a polyalkylene naphthalate.

18. (AMENDED) The air filter assembly [composition] of claim 16 wherein the condensation polymer comprises a polyethylene terephthalate.

19. (AMENDED) The air filter assembly [composition] of claim 14 wherein the condensation polymer comprises a nylon polymer comprising a homopolymer having repeating units derived from a cyclic lactam.

20. (AMENDED) The air filter assembly [composition] of claim 19 [14] wherein the nylon [co]polymer is combined with a second nylon polymer, the second nylon polymer differing in molecular weight or monomer composition.

21. (AMENDED) The air filter assembly [composition] of claim 19 [14] wherein the nylon [co]polymer is combined with a second nylon polymer, the second nylon polymer comprising an alkoxy alkyl modified polyamide.

22. (AMENDED) The air filter assembly [composition] of claim 20 wherein the second nylon polymer comprises a nylon copolymer.

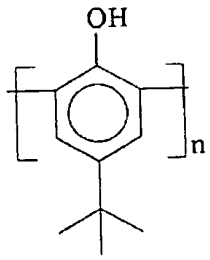
23. (AMENDED) The air filter assembly [composition] of claim 20 wherein the polymers are treated to form a single polymeric composition as measured by a differential scanning calorimeter showing a single phase material.

24. (AMENDED) The air filter assembly [composition] of claim 23 wherein the copolymer and the second polymer are heat treated.

25. (AMENDED) The air filter assembly [composition] of claim 24 wherein the copolymer and the second polymer are heat treated to a temperature less than the lower melting point of the copolymer [polymers].

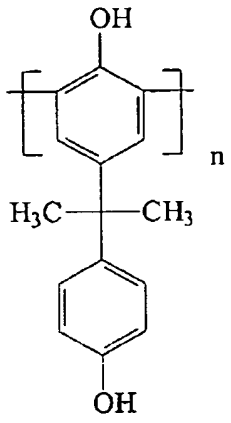
26. (AMENDED) The air filter assembly [composition] of claim 14 wherein the additive comprises an oligomer comprising tertiary butyl phenol.

27. (AMENDED) The air filter assembly [composition] of claim 26 wherein the additive comprises an oligomer comprising:



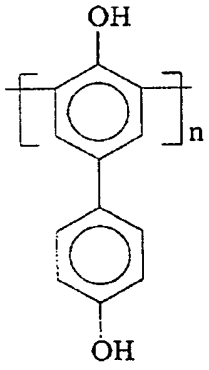
28. (AMENDED) The air filter assembly [composition] of claim 14 wherein the resin comprises an oligomer comprising bis-phenol A.

29. (AMENDED) The air filter assembly [composition] of claim 28 wherein the additive comprises an oligomer comprising:



30. (AMENDED) The air filter assembly [composition] of claim 14 wherein the resin comprises an oligomer comprising dihydroxy biphenyl.

31. (AMENDED) The air filter assembly [composition] of claim 30 wherein the additive comprises an oligomer comprising:



32. (AMENDED) The air filter assembly [composition] of claim 14 wherein the additive comprises a blend of the resinous additive and a fluoropolymer.

35. (AMENDED) The air filter assembly [composition] of claim 3 [14] wherein the condensation polymer comprises a polyurethane polymer.

36. (AMENDED) The air filter assembly [composition] of claim 14 [10] wherein the condensation polymer comprises a blend of a polyurethane polymer and a polyamide polymer.

37. (AMENDED) The air filter assembly [composition] of claim 36 wherein the polyamide polymer comprises a nylon.

38. (AMENDED) The air filter assembly [composition] of claim 37 wherein the nylon comprises a nylon homopolymer, a nylon copolymer or mixtures thereof.

39. (AMENDED) The air filter assembly [composition] of claim 14 wherein the condensation polymer comprises an aromatic polyamide.

40. (AMENDED) The air filter assembly [composition] of claim 14 wherein the condensation polymer comprises a reaction product of a diamine monomer and poly(m-phenylene isophthalamide).

41. (AMENDED) The air filter assembly [composition] of claim 36 wherein the polyamide comprises a reaction product of a diamine and a poly(p-phenylene terephthalamide).

42. (AMENDED) The air filter assembly [composition] of claim 14 wherein the condensation polymer comprises a polybenzimidazole.

43. (AMENDED) The air filter assembly [composition] of claim 14 wherein the condensation polymer comprises a polyarylate.

44. (AMENDED) The air filter assembly [composition] of claim 43 wherein the polyarylate polymer comprises a condensation polymerization reaction product between bis-phenol-A and mixed phthalic acids.

49. (AMENDED) An air filter assembly according to claim 1 wherein:

(a) said spacer wall includes a second air flow aperture therein; and wherein the assembly further includes:

(i) a second filter construction positioned in air flow communication with said second air flow aperture in said spacer wall; said second filter construction including an extension of a pleated filter media composite defining a second filter construction inner clean air chamber;

(A) said second filter construction being oriented with said second filter inner clean air chamber in air flow communication with said spacer wall second air flow aperture; and

(B) said pleated filter media composite of said second filter construction including a substrate at least partially covered by a layer of fine fiber;

(ii) a second Venturi element mounted in said spacer wall second air flow aperture and positioned to project into said second filter construction inner clean air chamber; and

(iii) a second blowpipe oriented to direct a pulse of air into said second Venturi element from said clean air chamber and toward said second filter construction.

50. (AMENDED) A method for filtering air; the air having a temperature of at least 140°F; the method comprising:

(a) directing the air through an inlet of a housing and into a filtering chamber; the housing including a spacer wall separating the [the] filtering chamber from a clean air chamber; the spacer wall including a first air flow aperture therein;

(b) after directing the air into the filtering chamber, directing the air through an extension of a pleated filter media composite of a first filter construction and into a filter construction inner clean air chamber; the first filter construction being positioned in air flow communication with the first air flow aperture in the spacer wall; the extension of a pleated filter media composite defining the filter construction inner clean air chamber;

(i) the first filter construction being oriented with the filter inner clean air chamber in air flow communication with the spacer wall first air flow aperture;

(ii) the media composite including a substrate, the substrate having a permeability of about 2 to 900 meters-min^{-1}, a basis weight not greater than 200 grams-m^{-2} and a thickness of 25 to 800 microns, the substrate at least partially covered by a layer said layer comprising fine fiber comprising a fiber with a diameter of about 0.1 to 0.5 microns, the layer having a thickness of about 1 - 8 times the fine fiber diameter, such that after exposure for a test period of 16 hours to test conditions of 140°F air and a relative humidity of 100% retains greater than 30% of the fiber unchanged for filtration purposes; and

(c) after directing the air through an extension of a pleated filter media composite of a first filter construction and into a filter construction inner clean air chamber, directing the air into the clean air chamber and out of the housing.

54. (AMENDED) A method according to claim 50 further including directing a pulse of air into each of the filter construction inner clean air chamber[s] to at least partially remove particulates collected on each of the pleated filter media composites.

55. (AMENDED) A method according to claim 51 wherein said step of directing a pulse of air into each of the filter construction inner clean air chamber[s] to at least partially remove particulates collected on each of the pleated filter media composite includes directing the pulse of air into a plurality of Venturi elements each mounted to project into a respective filter construction inner clean air chamber.

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Example 18

The following filter medias have been made with the methods described in Example 1-17.

Filter Media Examples

Substrate	Substrate perm (Frazier)	Substrate Basis wt (lbs/3000 sq ft)	Substrate Thickness (in)	Substrate Eff (LEFS)	Composite Eff \(LEFS)
Single fine fiber layer on single substrate (flow either direction through media	(+/- 10%	(+/- 10%)	(+/- 25%)	(+/- 5%)	(+/- 5%)
Cellulose air filter media	58	67	0.012	11%	50%
Cellulose air filter media	16	67	0.012	43%	58%
Cellulose air filter media	58	67	0.012	11%	65%
Cellulose air filter media	16	67	0.012	43%	70%
Cellulose air filter media	22	52	0.010	17%	70%
Cellulose air filter media	16	67	0.012	43%	72%
Cellulose/synthetic blend with moisture resistant resin	14	70	0.012	30%	70%
Flame retardant cellulose air filter media	17	77	0.012	31%	58%

Filter Media Examples (Continued)

Substrate	Substrate perm (Frazier)	Substrate Basis wt (lbs/3000 sq ft)	Substrate Thickness (in)	Substrate Eff (LEFS)	Composite Eff (LEFS)
Flame retardant cellulose air filter media	17	77	0.012	31%	72%
Flame retardant synthetic air filter media	27	83	0.012		77%
Spunbond Remay (polyester)	1200	15	0.007	5%	55%
Synthetic/cellulose air filter media	260	76	0.015	6%	17%
Synthetic/glass air filter media	31	70	0.012	55%	77%
Synthetic/glass air filter media	31	70	0.012	50%	90%

Filter Media Examples (Continued)

Substrate	Substrate perm (Frazier)	Substrate Basis wt (lbs/3000 sq ft)	Substrate Thickness (in)	Substrate Eff (LEFS)	Composite Eff (LEFS)
Synthetic (Lutrador-polyester)	300	25	0.008	3%	65%
Synthetic (Lutrador-polyester)			0.016		90%

Aq

Media has been used flat, corrugated, pleated, corrugated and pleated, in flatsheets, pleated flat panels, pleated round filters, and other filter structures and configurations.

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